CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

RADIOACTIVITY AND NUCLEAR CHEMISTRY

Wb Jee Workout Category 1 Single Option Correct Type

1. An element A emits an alpha particle and form B. A and B are

A. isotopes

B. isobars

C. isotones

D. nuclides

Answer: D

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2. If the amount of radioactive substance is increased three times, the number of atoms distintegrated per gram per unit time would be

A. doubel

B. remain one third

C. triple

D. not changed

Answer: D

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3. Which one of the following notations shows the product incorrectly ?

A. ${}_{99}Cm^{242}(\alpha, 2n)_{97}Bk(243)$

B. ${}_{5}B^{10}(\alpha, n)_{7}N^{13}$

C. ${}_{7}N^{14}(n, p)_{6}C^{14}$

D. ${}_{14}Si^{28}(d, n)_{15}P^{29}$

Answer: A

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4. Which of the following isotopes is likely to be most stable?

A. ${}_{30}Zn^{71}$

B. ${}_{30}Zn^{66}$

C. ${}_{30}Zn^{64}$

D. None of these

Answer: C

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5. ${}_{92}U^{235}$ belongs IIIB of the periodic table. If it losses one alpha particle, the new element will belong to group

A. I B

B. I A

C. III B

D. V B

Answer: B

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6. β - particle is emitted in radioactivity by

A. conversion of proton to neuton

B. from outermost orbit

C. conversion of neutron to proton

D. none of these.

Answer: C

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7. The product obtained after positron emission from $_{31}Ga^{68}$

A. $_{30}Ga^{68}$

B. $_{30}Zn^{68}$

C. $_{30}Zn^{69}$

D. $_{31}Ga^{69}$

Answer: B

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8. In the radioactive decay, ${}_{92}X^{232} \rightarrow {}_{89}Y^{20}$, how many α and β particles are ejected from X to from Y ?

A. 3α and 3β

B. 5α and 3β

C. 3α and 5β

D. 5α and 5β

Answer: A

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9. In the case of a radioisotope, the value of .....and .....are indentical in magnitude. The value is

A. 1/0.693

B. $(0.693)^2$

C. 0.693

D. $(0.693)^{1/2}$

Answer: D

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10. The product p of the nuclear reaction

$_{92}^{235}U + _{0}^{1}n \rightarrow p + _{36}^{92}Kr + 3_{0}^{1}n$ is

A. $_{56}^{141}Sr$

B. $_{56}^{141}La$

C. $_{56}^{141}Ba$

D. $_{56}^{141}Cs$

Answer: C

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11. The nuclides with Z > 20 lying below the stability belt decay by

A. β^+-emission

B. K-electron capture

C. both (a) and (b)

D. β^--emission

Answer: C

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12. What will be the product of reaction, ${}^{255}_{101}Md(\alpha, 2n)$?

A. ${}^{256}_{103}Lr$

B. ${}^{257}_{102}No$

C. ${}^{257}_{103}Lr$

D. ${}^{205}_{82}Pb$

Answer: C

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13. If n_t number of radiatoms are present at time t, the following expression will be a constant.

A. n_t / t

B. $\ln n_t / t$

C. $d\ln n_t / dt$

D. $t \cdot n_t$

Answer: C

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14. An artificial readioactive isotope gave ${}_{7}^{14}N$ after two successive β-particle emissions. The number of neutrons in the present nucleus must be

A. 9

B. 14

C. 5

D. 7

Answer: A

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15. ^{23}Na is more stable isotope of Na. Find out the process by which $^{24}_{11}Na$ can undergo radioactive decay.

A. β^--emission

B. α-emission

C. β^+-emission

D. K-electron capture

Answer: A

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16. half life of a radioactive substance which disintegrates by 75% in 60 minutes will be

A. 120 min

B. 30 min

C. 45 min

D. 20 min

Answer: B

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17. A radioisotope has a ..... Of 10 days. If today 125 g of it is left, what was its weigh 40 dayscarlicr?

A. 600 g

B. 1000 g

C. 1250 g

D. 2000g

Answer: D

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18. A radioisotope will not emit

A. α and β-rays simula

B. β and γ-rays simultaneously

C. γ and α-rays simultaneously

D. γ -rays only

Answer: D

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19. The half-life of a radioactive element is 10 hours. How much will be left after 4 hours in 1 g atom sample ?

A. 45.6×10^{23} atoms

B. 4.56×10^{23} atoms

C. 4.56×10^{24} atoms

D. 4.56×10^{25} atoms

Answer: B

View Text Solution

20. Unstable substances exhibit higher radioactivity due to

A. low p/n ratio

B. high p/n ratio

C. p/n = 1

D. none of these

Answer: A

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21. The order of density of the nucleus is

A. $10^8 kg/cc$

B. $10^{11} kg/cc$

C. $10^{15} kg/cc$

D. $10^{18} kg/cc$

Answer: B

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22. The nucleus resulting from $^{238}_{92}U$ after successive loss of two alpha and four beta particles is

A. $^{234}_{90}Th$

B. $^{230}_{94}Pu$

C. $^{230}_{88}Ra$

D. $^{230}_{92}U$

Answer: D

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23. Which of the following elemnetns belongs to 4n - series?

A. Pb - 207

B. Bi - 209

C. Pb - 208

D. Pb - 206

Answer: C

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24. $^{210}_{84}Po \rightarrow {}^{206}_{82}Pb + {}^{4}_{2}He$

From the above nuclear reaction, predict the position of polonium in the periodic table (leads belongs to group IV A).

A. IIA

B. IV B

C. VI B

D. VI A

Answer: D

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25. Which one of the following radiosotopes is used in the treatment of blood cancer?

A. P^{32}

B. Co^{62}

C. I^{131}

D. Na^{24}

Answer: A

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26. If the mass defet of ${}_{4}^{9}X$ is 0.090 amu, their binding energy per nucleon is (1 amu = 931.5 MeV)

A. 9.315 MeV

B. 931.5 MeV

C. 83.0 MeV

D. 8.38 MeV

Answer: A

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27. Arrange the following in increasing order of their penetrating power.

(α, β, γ, X-rays).

A. α-rays lt β-rays lt γ-rays lt X -rays

B. α-rays lt β-rays lt X -rays lt γ-rays

C. X -rays lt γ-rays lt β-rays lt α-rays

D. γ-rays lt β-rays lt α-rays lt X -rays

Answer: B

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28. The half-life of Rn is 46 days, what amount will be left from 2 mole of it after 138 days?

A. 0.25 mole

B. 1.25 mole

C. 0.40 mole

D. 0.62 mole

Answer: A

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29. Radioactivity of a sample $(Z = 22)$ decreases 90% after 10 years. What will be the half-life of the sample ?

A. 5 years

B. 2 years

C. 3 years

D. 10 years

Answer: C

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30. ${}_{11}Na^{24}$ is radioacitive and it decays to

A. ${}_{9}F^{20}$ and α-particles

B. ${}_{13}AI^{24}$ and positron

C. ${}_{11}Na^{23}$ and neutron

D. ${}_{12}Mg^{24}$ and β-particles.

Answer: D

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Wb Jee Workout Category 2 Single Option Correct Type

1. A sample of U - 238 (half-life = 4.5×10^9yr) ore is found to contain 23.8 g of U-238 and 20.6 g of Pb - 206. What will be the age of the ore?

A. 5.5×10^{12} years

B. 6.0×10^8 years

C. 4.5×10^9 years

D. 5.5×10^{14} years

Answer: C

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2. If the half-life of a radioisotope is 4 days, then how long would it take for 75% disitegration of the sample?

A. 8 days

B. 10 days

C. 12 days

D. 14 days

Answer: A

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3. Calculate the no. of disintegrations which 1 g of radioactive element ^{200}X undergoes per sec. $t_{1/2}$ of X = 1000 years.

A. 3.66×10^{10} dps

B. 6.6×10^{10} dps

C. 10^{11} dps

D. 1.0×10^{10} dps

Answer: B

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4. Sulphur $-35(34.96903$ amu) a β-particle but no γ-ray. The product is chlorine - 35 (34.96885 a.m.u). The maximum energy emitted by the β-particle is

A. 16.758 MeV

B. 1.6758 MeV

C. 0.16758 MeV

D. 0.016758 MeV

Answer: C

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5. Mass of $^{7}_{3}Li$ is 7.016004 amu. Mass of proton is 1.007277 amu and mass of neutron is 1.008665 amu. Mass defect of lithium nucleus in amu is

A. 0.04948 amu

B. 0.04050 amu

C. 0.04052 amu

D. 0.04055 amu

Answer: A

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6. The radioisotope, tritium $\left({}_{1}^{3}H\right)$ has a half-life of 12.3 years. If the initial amount of tritium is 32 mg. how many milligrams of it would remain after 49.2 years?

A. 1 mg

B. 2 mg

C. 4 mg

D. 8 mg

Answer: B

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7. A human body required 0.01 M activity of a redioactive substance after 24 hours. Half life of the radioactive substance is 6 hours. The

injection of maximum activity of the radioactive substance that can be injected is

A. 0.08

B. 0.04

C. 0.16

D. 0.32

Answer: C

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8. A radioactive isotope having a half life of 2.3 days was received after 9.2 days. It was found that there were 300 mg of the isotope in the container. The initial amount of the isotope was

A. 3600 mg

B. 1200 mg

C. 2400 mg

D. 4800 mg.

Answer: D

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9. The wt. in g of 1 curie of radioactive element ^{200}X having a $t_{1/2}$ of 63.3 is

A. 3.7×10^{-8} g

B. $200g$

C. $7.4 \times 10^{-8}g$

D. $3.0 \times 10^{-8}g$

Answer: C

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10. A piece of wood from an aechaeological source shows a C - 14 activity which is 60% of the activity found today. Calculate the age of the sample $t_{1/2}$ for $^{14}_{6}C$ = 5770 years).

A. 3515 years

B. 300 year

C. 4253 year

D. 4000 years

Answer: C

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11. Equal amounts of two samples of carbon were burnt and the radioactivities of CO_2 formed were measured. The activitied were 2100and 1400 counts per week respectively. What will be the age difference of the sample. [$t_{1/2}$ for $C^{14} = 5600$ years]

A. 2002 years

B. 2345 years

C. 4250 years

D. 3343 years

Answer: D

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12. The half-life of a radioisotope is 20 years. If the sample has an initial activity of 640 dps,than what will be its activity after 80 years?

A. 20 dps

B. 30 dps

C. 40 dps

D. 50 dps

Answer: C

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13. A radioelement has atomic number 90 and mass number 232. What is the atomic number

and mass number of the end product obtained by loss of $6-\alpha$ and $4-\beta$ particles?

A. 82208

B. 88206

C. 82206

D. 84, 204

Answer: A

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14. A wood piece is 11460 years old. What is the fraction of ^{14}C activity left in the piece ? (Half-life period of ^{14}C is 5730 years)

A. 0.12

B. 0.25

C. 0.50

D. 0.75

Answer: B

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15. At a certain instant a piece of radioactive material contains 10^{12} atoms. The half-life of the material is 30 days. What will be number of distingrations per second of the sample at that instant?

A. 3.96×10^6 dps

B. 4.02×10^5 dps

C. 2.66×10^5 dps

D. 1.96×10^6 dps

Answer: C

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Wb Jee Workout Category 3 One Or More Than One Correct Type

1. The number of α and β emitted in the nuclear reaction $^{238}_{92}U \rightarrow {}^{214}_{82}Pb$ is

A. 8β

B. 6α

C. 2β

D. 5α

Answer: B::C

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2. What of the following is/are correct?

A. α-rays are more penetrating than β-rays

B. α-rays have greater ionizing power than β- rays.

C. β- particles are not present in the nucleus,yet they are emitted form the nucleus.

D. γ-rays are electromagnetic rays.

Answer: B::C::D

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3. The fissionable material commonly used in atomic bomb is (are)

A. $^{235}_{92}U$

B. $^{238}_{92}U$

C. $^{239}_{94}Pu$

D. $^{232}_{90}Th$

Answer: A::C

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4. In the nuclear transmutation.

$^{9}_{4}Be + X \rightarrow {}^{8}_{4}Be + Y$

(X, Y) is (are)

A. (γ, n)

B. (p, D)

C. (n, D)

D. (γ, p)

Answer: A::B

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5. Nuclear reactions accompained with emission of neutron(s) are

A. $^{27}_{13}Al + ^{4}_{2}He \rightarrow ^{30}_{15}P$

B. $^{12}_{6}C + ^{1}_{1}H \rightarrow ^{13}_{7}N$

C. $^{30}_{15}P + ^{0}_{-1}e \rightarrow ^{30}_{14}Si$

D. $^{241}_{96}Cm + ^{4}_{2}He \rightarrow ^{244}_{97}Bk + ^{0}_{-1}e$

Answer: A::D

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6. Which of the following is/are correct?

A. Atom bomb and H-bomb both are example of nuclear fission.

B. Nuclear reactions are markedly affected by temperature.

C. Electron and position both have same mass.

D. The lesser the half-life, the lesser is the number of atoms undergoing decay in a given time.

Answer: C

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7. Which of the following is/are not correct?

A. Loss of $\beta -$ particle produces an isotope.

B. Loss of one α and β- particles produces an isotope.

C. Loss of mass takes place only during nuclear fission or fusion

D. Uranium is a transuranic element.

Answer: C::D

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8. When an isotope undergoes K-capture, its mass number

A. remains the same while the atomic number increases by one

B. remains the same while the atomic number increases by two

C. remains the same while the atomic number decreases by one

D. remains the same while the atomic number decreases by two.

Answer: C

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9. The value of distergration constant of a radioactive isotope

A. decreases with increasing temperature

B. decreases will increasing pressure

C. increases with increasing concentration

D. is independent of temperature, pressure and concentration.

Answer: D

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10. A plot of the number of neutrons (n) against the number of protons (p) of stable nuclei exhibits upward deviation from linearity for atomic number, Z > 20. For an unstable nucleus having n, p ratio less than 1, the possible mode(s) of decay is(are)

A. β^--decay (βemission)

B. orbital or K- electron capture

C. neutron emission

D. β^+-decay (positron emission).

Answer: B::D

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Wb Jee Previous Years Questions Category 1 Single Option Correct Type

1. The half-life for decay of ^{14}C by β-emission is 5730 years. The fraction of ^{14}C decays, in a sample that is 22,920 years old, would be

A. $1/8$

B. $1/16$

C. $7/8$

D. $15/16$

Answer: D

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2. During the emission of a positron from a nucleus, the mass number of the daughter element ramains the same but the atomic number

A. is decreased by 1 unit

B. is decreased by 2units

C. is increased by 1 unit

D. remains unchanged.

Answer: A

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3. β-emission is always accompanied by

A. for of antineutrino and α-particle

B. emission of α-particle and γ-ray

C. formation of antineutrino and γ-ray

D. formation of antineutrino and positron.

Answer: C

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4. $_{98}Cf^{246}$ was formed along with a neutron when an unknown radioactive substance was bombarded with $_{6}C^{12}$. The unknown substance was

A. ${}_{91}Pa^{234}$

B. ${}^{Th^{234}}_{90}$

C. ${}_{92}U^{235}$

D. ${}_{92}U^{238}$

Answer: C

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5. $\left({}_{32}Ge^{76}, {}_{34}Se^{76}\right)$ and $\left({}_{14}Si^{30}, {}_{16}S^{32}\right)$ are example of

A. isotopes and isobars

B. isobars and isotones

C. isotones and isotopes

D. isobars and isotopes.

Answer: B

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6. An element E loses one α and two β-particles in three successive stages. The resulting element will be

A. an isobar of E

B. an isotone of E

C. an isotope of E

D. E itself.

Answer: C

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7. If radium and chlorine combine to fom radium chloride, the compound would be

A. half as radioactive as radium

B. twice as rdioactive

C. as radioactive as radium

D. not radioactive.

Answer: C

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8. $C_6H_5F^{18}$ is a F^{18} radio - isotope labelled organic compound. F^{18} decays by positron emission. The product resulting on decay is

A. $C_6H_5O^{18}$

B. $C_6H_5Ar^{19}$

C. $B^{12}C_5H_5F$

D. $C_6H_5O_{16}$

Answer: A

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9. The half-life of C^{14} is 5760 years.for a 200 mg sample ofC^{14} , the time taken to change to 25 mg is

A. 11520 years

B. 23040 years

C. 5760 years

D. 17280 years.

Answer: D

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10. The nucleus $^{64}_{29}Cu$ accepts an orbital electron to yield

A. $^{65}_{28}Ni$

B. $^{64}_{30}Zn$

C. $^{64}_{28}Ni$

D. $^{65}_{30}Zn$

Answer: C

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11. The half-life period of ..... is 60 days. The radioactivity after 180 days will be

A. 0.25

B. 0.125

C. $33.3\ \%$

D. $3.0\ \%$

Answer: B

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12. Consider the radioactive disintegration

$${}_{82}A^{210} \rightarrow B \rightarrow C \rightarrow {}_{82}D^{206}$$

The sequence of emission can be

A. β, β, β

B. α, α, β

C. β, β, γ

D. β, β, α

Answer: D

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Wb Jee Previous Years Questions Category 2 Single Option Correct Type

1. A piece of wood from an aechaeological sample has 5.0 counts min^{-1} per gram of C - 14, while a fresh sample of wood has a count of $15.0\mathrm{min}^{-1}$. If half-life of C-14 is 5770 years, the age of the archaeological sample is

A. 8,500 years

B. 9,200 years

C. 10,000 years

D. 11,000 years

Answer: B

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